

## Education

Ph.D. Science Education, Stanford University (2016)

Dissertation title: *An Experimental Exploration of How Text-Based Instruction in School Biology Affects Belief in Genetic Essentialism of Race in Adolescent Populations*

Dissertation Committee: Bryan Brown, Jonathan Osborne, Noah Rosenberg, Janet Carlson & Carol Dweck. Advisors: Bryan Brown and Jonathan Osborne

M.Sc. Biology, Stanford University (2016)

Advisor: Noah Rosenberg

Master of Arts in Teaching, University of San Francisco (2009)

Advisor: Noah Borrero

Bachelor of Arts in Biology, The Colorado College (2001)

Advisor: Sylvia Kelso

## Academic Appointments

Senior Research Scientist, The Biological Sciences Curriculum Study (March 2021 - Present)

Research Scientist, The Biological Sciences Curriculum Study (July 2016 - February 2021)

## Awards and Fellowships

1. *National Association for Research in Science Teaching Early Career Research Award* (2020): An award given annually to the early researcher who demonstrates the greatest potential to make outstanding and continuing contributions to educational research.
2. *Most Downloaded Paper Award* (2018-2019) for *Science Education*
3. *National Science Teacher Association Research Worth Reading Award* (2017): An award given to a peer reviewed science education manuscript that is relevant to the practice of science education.
4. *Stanford Interdisciplinary Graduate Fellowship* (2014-2016): The Stanford Interdisciplinary Graduate Fellowship (SIGF) Program is a competitive university-wide program that awards a three-year fellowship (\$37,000 per year plus \$40,000 in tuition) and a \$3000 dissertation grant to outstanding doctoral students engaged in interdisciplinary research.
5. *Herbst Award for Teaching Excellence* (2009): A \$2000 award given each year to one teacher in San Francisco Independent and Parochial Schools for demonstrating excellence in the classroom.

## Federal Grants

1. Principal Investigator: *Collaborative Research: Exploring how learning about the genetics of sex differences impacts genetic essentialism and STEM belonging and interest*. Click [here](#) for a description (NSF CORE # 1956152, USD \$1.3 million, July 1<sup>st</sup>, 2020 - Present)
2. Principal Investigator: *Collaborative Research: Honoring the complexity of genetics – Exploring how the learning of multifactorial genetics affects belief in genetic determinism*. Click [here](#) for a description (NSF IUSE # 1914843, \$679,915, January 17<sup>th</sup>, 2020 - Present)
3. Principal Investigator: *Towards a More Human(e) Genetics Education: Exploring How Knowledge of Genetic Variation and Causation Affects Racial Bias Among Adolescents*. Click [here](#) for a description (NSF CORE # 1660985, \$1,299,037, August 31<sup>st</sup>, 2017 - Present).
4. Principal Investigator: *Collaborative Research: Reducing Racial Prejudice by Fostering an Ontologically and Epistemologically Complex Understanding of Human Genetics Research*. (NSF DRK-12, [under review](#)).

## Publications

1. **\*Donovan, B. M.**, Salazar, B., Weindling, M. (forthcoming) How can we make genetics education more humane? *Genetics Education for the 21<sup>st</sup> Century*.
2. **\*Donovan, B. M.**, Weindling, M., Lee, D. (2020). From Basic to Humane Genomics Literacy: How Different Types of Genetics Curricula Could Influence Anti-Essentialist Understandings of Race. *Science & Education*.
3. **\*Donovan, B. M.**, Weindling, M., et al. (2020). Genomics Literacy Matters: Supporting the development of genomics literacy through genetics education could reduce cognitive forms of racial prejudice. *Journal of Research in Science Teaching*.
4. **\*Zummo, L., Donovan, B. M.**, Busch, K.C. (2020). Complex influences of mechanistic knowledge, worldview, and quantitative reasoning on climate change discourse: Evidence for ideologically motivated reasoning among youth. *Journal of Research in Science Teaching*.
5. **\*Stuhlsatz, M., Buck Bracey, Z., Donovan, B. M.** (2020). Conflation of Sex and Gender Language in Students' Scientific Explanations. *Science & Education*.
6. <sup>^</sup>**\*Donovan, B. M.**, et al. (2019). Towards a More Humane Genetics Education: Learning about the social and quantitative complexities of human genetic variation research could reduce racial bias in adolescent and adult populations. *Science Education*. 103(3), 539-560.
7. **Donovan, B.M.**, Stuhlsatz, M., Edelson, D.C., Buck Bracey, Z.B. (2019) Gendered Genetics: How reading about the genetic basis of sex differences in biology textbooks could affect beliefs associated with science gender disparities. *Science Education*. 103(4), 719-749.
8. Brown, B. A., **Donovan, B.**, Wild, A. (2019) Language and Cognitive Interference: How using complex science language limits cognitive performance. *Science Education*.
9. **Donovan, B.M.** (2018). Looking backwards to move biology education toward its humanitarian potential: A review of Darwinism, Democracy, and Race. *Science Education*.
10. Patterson, A., Roman, D., Friend, M., Osborne, J., **Donovan, B.**, (2018). Reading for Meaning: The Foundational Knowledge Every Teacher of Science Should Have. *International Journal of Science Education*. pp. 1-17.
11. **Donovan, B. M.** (2017) Learned inequality: Racial labels in the biology curriculum can affect the development of racial prejudice. *Journal of Research in Science Teaching*. 54(3), 379-411.
12. Smith, E., Romero, C., **Donovan, B.**, Herter, R., Paunesku, D., Cohen, G. Dweck, C.S., Gross, J.J. (2017). Emotion Theories and Adolescent Well-Being: Results of an Online Intervention. *Emotion*.
13. **Donovan, B. M.** (2016). Framing the genetics curriculum to support social justice: An experimental exploration of how the biology curriculum influences students' beliefs about the racial achievement gap. *Science Education*. 100(3), 586-616.
14. Osborne, J., **Donovan, B. M.**, Henderson, J. B., MacPherson, A. C., & Wild, A. (2016). *Arguing from Evidence in Middle School Science: 24 Activities for Productive Talk and Deeper Learning*. Thousand Oaks: CA: Corwin Press.
15. **Donovan, B. M.** (2015a). Putting humanity back into the teaching of human biology. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*. 52, 65-75.
16. **Donovan, B. M.** (2015b). Reclaiming race as a topic of the United States biology curriculum. *Science Education*. 99(6) 1092-1117.
17. Brown, B. A., Henderson, J. B., Gray, S., **Donovan, B. M.**, et al., (2015). From description to explanation: An empirical exploration of the African-American pipeline problem in STEM. *Journal of Research in Science Teaching*.

### **Publications Continued**

18. **Donovan, B. M.** (2014). Playing with fire? The impact of the hidden curriculum in school genetics on essentialist conceptions of race. *Journal of Research in Science Teaching*, 51(4), 462–496.
19. **Donovan, B. M.**, Moreno Mateos, D., Osborne, J. F., & Bisaccio, D. J. (2014). Revising the Economic Imperative for US STEM Education. *PLoS Biology*, 12(1), e1001760.
20. Brown, B. A., Henderson, J. B., Gray, S., **Donovan, B.**, & Sullivan, S. (2013). From Access to Success: Identity Contingencies & African-American Pathways to Science. *Higher Education Studies*, 3(1) 13pp.

\* principal investigator, <sup>2</sup> top downloaded paper 2018-2019 in *Science Education*: <https://s1133198723.t.eloqua.com/e/f2>

### **Guest-Edited Collections**

Donovan, B., & Martschenko, D.O. (2021). Race, Genetics, and Genetics Education. *Ethical, Legal and Social Implications of Genetics and Genomics Hub*. <https://elsihub.org/news/elsihub-collections-race-genetics-and-genetics-education>

Donovan, B., & Nehm, R. H. (2020). Genetics and Identity: Introduction to the Special Issue. *Science & Education*, s11191-020-00180-0. <https://doi.org/10.1007/s11191-020-00180-0>

### **Higher Education Teaching**

1. Teaching Assistant, EDUC 267e, course on curriculum and instruction in science for pre-service elementary school science teaching candidates, Stanford University (2015).
2. Teaching Fellow, EDUC 267b, EDUC 267c, two-course sequence of curriculum and instruction in science for pre-service middle and high school science teaching candidates, Stanford Teacher Education Program, Stanford University (2013-2014).
3. Teaching Assistant, EDUC 267a, EDUC 267b, EDUC 267c, three-course sequence of curriculum and instruction in science, Stanford Teacher Education Program, Stanford University (2011-2012). Co-taught with professors Bryan Brown and Jonathan Osborne.
4. Mentor Teacher in Science Education, The Breakthrough Collaborative (Summer 2011). Mentored and supervised a cohort of four undergraduates as they taught science.

### **K-16 Science Teaching and Informal Science Teaching**

1. Undergraduate Statistics Instructor, Gateways to Science and Mathematics Project (Summer 2012): Outreach to increase African-American participation in STEM fields and Education.
2. Middle School Science Teacher, The San Francisco School (2006-2011): Taught seventh grade life science and eighth grade physical science in an urban K-8 school committed to social and environmental justice. I wrote and then taught a curriculum using the teaching for understanding framework to address: (i) biodiversity loss, ecology, environmental justice, and indigenous rights; (ii) evolution, genetics, scientific racism, and human genetic diversity; (iii) the chemistry and physics of climate change; and (iv), the physics of water bottle rockets.
3. High School Science Teacher, Mission High School (Summer 2006).
4. Elementary and Middle School Science Teacher, The Town School for Boys (2004-2006).
5. Elementary Level Substitute Teacher, The Prospect Sierra School (2003-2004).
6. Outdoor Educator, Aspen Achievement Academy (2001-2002).

### **Advising**

1. BSCS Science Learning, (September 2017 – Present): To date, I have mentored four post-baccalaureate research assistants and one postdoctoral associate in my learning lab.
2. Stanford University (2012-2015): Co-advised an undergraduate during his honor's thesis.

### **Research Training**

1. Research Scientist, Collaborative Research: Extending and Investigating the Impact of the High School Model-Based Educational Resource (MBER), BSCS (August 2018 – Present): In this DRK-12, we explore the impact of the MBER program on students' model-based reasoning in biology via a cluster-randomized trial *PI: Chris Wilson*
2. Research Scientist, Measuring scientific argumentation, BSCS (August 2016 – Present): This NSF CORE project applies machine learning to the measurement of students' ability to construct explanations and engage in argument from evidence. *PI: Chris Wilson*
3. Research Scientist, Scientific Data in Schools: Measuring the Efficacy of an Innovative Approach to Integrating Quantitative Reasoning in Secondary Science, BSCS (January 2017 – Present): This NSF funded collaboration between BSCS and Michigan State University explores whether bringing real-world, scientific data into middle and high school classrooms can impact students' quantitative reasoning in science. *PI: Molly Stuhlsatz*
4. Research Scientist, Teaching Students to Reason about Variation and Covariation in Data: What Do We Know and What Do We Need to Find Out? BSCS (2019 – 2020): In this NSF CORE, we are conducting a landscape review and meta-analysis of research that explores practices for teaching quantitative reasoning through school science. *PI: Sue Kowalski*
5. Research Scientist, Measuring science teacher PCK, BSCS (2016 – 2019): This NSF PRIME funded project applies machine learning to the measurement of science teacher pedagogical content knowledge. *PI: Chris Wilson*
6. Research Assistant, Catalyzing Comprehension through Discussion and Debate, Stanford Graduate School of Education, (2012—2016): Little is known about how science educators teach reading in science, or whether the practice of teaching reading in science is a malleable factor that can be influenced through professional development interventions. This IES project explored how science teachers conceptualized the teaching of reading and enacted it in their classrooms through interviews and video-based analyses of teaching. *PI: Jonathan Osborne.*
7. Research Assistant, Improving Academic Achievement by Teaching Growth Mindsets about Emotion, Stanford Department of Psychology (2012—2014): Disruptive emotions such as anger, sadness, and stress can impede academic performance in school through a variety of different mechanisms. The primary goal of this project was to develop and test a curricular intervention capable of improving the academic performance of middle school students by teaching them that difficult emotions are malleable and can be effectively regulated by changing your thinking, changing your attention, or changing your situation. *PIs: Carol Dweck, Geoff Cohen, & James Gross.*
8. Research Assistant, Insect Flux Across Ecotones, Stanford Department of Biology (2013).
9. Forest Ecologist & Wildlife Biologist, Southwest Research, Colorado & Utah (2003).
10. Forest Ecologist, Rocky Mountain Research Station, United States Forest Service (2002-2003).

### Invited Research Talks

1. University of California, Riverside, Department of Biology (2021)
2. The University of Utah, School of Medicine (2020)
3. The University of Iowa, Department of Biology and College of Education (2020)
4. The University of California, San Diego, Department of Biology (2020)
5. The University of Colorado at Boulder, Center for Medieval and Early Modern Studies and the History Department (2019)
6. The University of Colorado at Boulder, Department of Molecular, Cellular and Developmental Biology (2019)
7. The Weizmann Institute, Rehovot, Israel (2019)
8. Stanford University, Science Education Research Group, Stanford, CA (2019)
9. University of California, Santa Cruz, Department of Education, Santa Cruz, CA (2019)
10. California State Polytechnic University, Department of Education, San Luis Obispo, CA (2018)
11. Harvard Medical School, Department of Genetics, Boston, MA (2018)
12. Colorado College, Departments of Molecular Biology, Organismal Biology and Ecology, and Psychology, Colorado Springs, CO (2018)
13. University of California, Berkeley, Graduate School of Education, Berkeley, CA (2017)
14. Stanford University, Science Education Research Group, Stanford, CA (2017)
15. University of Maine, Center for Research in STEM Education, Orono, ME (2017)
16. University of Southern California, Los Angeles, CA (2015)
17. University of San Francisco, San Francisco, CA (2014)

### Upcoming Invited Talks

18. Science Education Department at Harvard-Smithsonian Center for Astrophysics – March 2021
19. UC Davis Center for Population Biology – April 2021
20. Association of Professors of Human and Medical Genetics – May 2021

### Conference Presentations

- Donovan, B.M.** (2019) Towards A More Human(e) Genetics Education: The Impact of Human Genetics Education on Adolescent Conceptions of Race. *Paper presented at the Annual Meeting of the American Academy for the Advancement of Science, Washington DC.*
- Donovan, B.M.** (2018) Towards A More Human(e) Genetics Education: Learning about Human Genetic Variation Reduces Racial Bias. *Paper presented at the 10<sup>th</sup> Annual Biology Education Research Symposium, San Diego, CA.*
- Donovan, B.M.,** Stuhlsatz, M., Edelson, D., Buck Bracey, Z. (2018) Gendered Genetics: Reading about the genetics of sex differences could affect gender stereotypes about intelligence. *Paper presented at the annual meeting of the National Association of Research in Science Teaching, Atlanta, GA.*
- Donovan, B.M.** (2018) Learned Inequality: Racial labels in the biology curriculum can affect the development of racial prejudice. *Paper presented at the annual meeting of the National Association of Research in Science Teaching in response to the NSTA “research that matters” award, Atlanta, Georgia.*
- Donovan, B.M.,** Semmens, R., Keck, P., Brimhall, E., Busch, K.C. (2017). A Human(e) Genetics Education: Teaching about human genetic variation reduces racial bias amongst adolescents. *Paper presented at the annual Meeting of the National Association for Research in Science Teaching, San Antonio, Texas.*
- Edelson, D., **Donovan, B.M.,** Stuhlsatz, M. (2017). Gendered interest: High school genetics curricula activate topical interest in biology amongst girls. *Paper presented at the annual Meeting of the National Association for Research in Science Teaching, San Antonio, Texas.*



### Conference Presentations Continued

- Donovan, B.M.** (2016) Learned Inequality: Racial Labels in the Biology Curriculum Can Affect the Development of Racial Prejudice by Affecting the Perception of Human Biological Variation. *Paper presented at the annual meeting of the National Association of Biology Teachers, Denver, Colorado.*
- Osborne, J., & **Donovan, B. M.** (2016). Developing Elementary and Middle School Teachers' Capabilities to Support Reading for Learning in Science. *Paper presented at the 2016 annual meeting of the National Association for Research in Science Teaching, Baltimore, Maryland.*
- Donovan, B. M.** (2016). Learned Inequality: Racial labels in the biology curriculum can affect the development of racial prejudice by affecting the perception of human biological variation. *Paper presented at the 2016 annual meeting of the National Association for Research in Science Teaching, Baltimore, Maryland.*
- Donovan, B. M.** (2015). The educational debt of school biology? Evidence that students' intentions to fix the racial achievement gap are affected by subtle racial framings of monogenic diseases. *Paper presented at the 2015 annual meeting of the International Society for the History, Philosophy, and Social Studies of Biology. Montreal, Quebec.*
- Donovan, B.M.** (2014). Playing with Fire? The Impact of the Hidden Curriculum in School Genetics on Essentialist Conceptions of Race. *Paper presented at the 2014 Genomics and Philosophy of Race Conference. University of California Davis, Davis, CA.*
- Osborne, J., Roman, D., **Donovan, B.M.**, Friend, M., Patterson, A.P. (2014). Towards a pedagogical content knowledge for literacy instruction in science. *Paper presented at the 2014 annual meeting of the National Association for Research in Science Teaching Conference, Pittsburgh, PA.*
- Donovan, B.M.** (2014). Playing with fire? The Impact of the Hidden Curriculum in School Genetics on Essentialist Conceptions of Race. *Paper presented at the 2014 annual meeting of the National Association for Research in Science Teaching Conference, Pittsburgh, PA.*

### In-Service Professional Developments Offered to Science Teachers

- Donovan, B. M.** (2019-present). Humane genetics institutes. This five day explores the learning theories, instructional frameworks and curriculum for teaching genetics to reduce racism.
- Strode, P., **Donovan, B. M.** (2020). Playing with Fire? How We Perpetuate Biological Beliefs about Race in the Classroom and How to Avoid it. *Workshop offered at the Annual Meeting of the University of Iowa Darwin Days Celebration in Iowa City, IA.*
- Donovan, B. M.**, Strode, P., Weindling, M. (2019). Avoiding Teaching Genetic Determinism: Model-based Reasoning That Helps Students Understand Multifactorial Models of Genetic Inheritance. *Workshop offered at the Annual Meeting of the National Association of Biology Teachers in Chicago, Ill.*
- Donovan, B. M.**, Weindling, M., Salazar, B. (2019). Teaching Genetic Variation and Multifactorial Genetics to Reduce Racism. I developed and taught this four-day institute for twelve teachers participating in my NSF grant. Held at BSCS Science Learning.
- Donovan, B. M.**, Strode, P., Keck, P. (2018). Playing with Fire? How We Perpetuate Biological Beliefs about Race in the Classroom and How to Avoid it. *Workshop offered at the Annual Meeting of the National Association of Biology Teachers in San Diego, CA.*
- Donovan, B. M.**, Strode, P., Keck, P. (2018). Engaging students in model-based learning about multifactorial genetics. *Workshop offered at Boulder Valley School District, CO.*

### **Professional Developments Offered to Science Teachers Continued**

Co-teacher, *Reading to Learn in Science*, Stanford Graduate School of Education (2012-2014):

I co-designed and co-taught a two-year professional development for in-service elementary and middle school teachers that developed their pedagogical content knowledge for teaching reading in science. For more details see <http://serpmedia.org/rtl/index.html>

Osborne, J., & **Donovan, B. M.** (2014). Supporting Literacy in Science Instruction. *Workshop offered at the National Science Teacher Association Conference, Long Beach, CA.*

**Donovan, B.M.**, & Friend, M. (2013). Read It, Write It, Talk It: Practical Strategies for Addressing Literacy Development in Science Instruction. *Workshop offered at the National Science Teacher Association Conference, San Antonio, TX.*

**Donovan, B.M.** (2011). Becoming a bad scientist. *Workshop offered at the annual meeting of the California Association of Independent Schools Northern Regional Meeting, Oakland, CA.*

**Donovan, B.M.** (2011). Educating the heart of a scientist: Field-based science instruction for environmental justice. *Workshop offered at the Bay Area Teacher Development Collaborative, San Francisco, CA.*

**Donovan, B.M.** (2010). How to become a bad scientist. *Workshop offered at the annual meeting of the California Science Teacher Association, Sacramento, CA.*

### **Media Mentions**

*The New York Times*: <https://www.nytimes.com/2019/12/07/us/race-biology-genetics.html>

*The Independent*: <https://www.independent.co.uk/news/science/school-racism-children-textbooks-race-prejudice-education-sickle-cell-africa-a8780296.html>

*The Atlantic & Undark*: <https://www.theatlantic.com/science/archive/2018/09/teaching-race-high-school-biology-textbooks/570319/>

*Ed Week*: [https://blogs.edweek.org/edweek/inside-school-research/2019/03/preventing\\_racism\\_science\\_classes\\_.html](https://blogs.edweek.org/edweek/inside-school-research/2019/03/preventing_racism_science_classes_.html)

*Learning and The Brain*: <https://www.learningandthebrain.com/blog/how-can-we-encourage-girls-to-pursue-stem-disciplines/>

AAAS: <https://www.eurekalert.org/aaasnewsroom/2019/webcast/?b=10> (starts at 9 min. 14 sec.)

*Australian Broadcasting System*: <https://www.abc.net.au/radionational/programs/scienceshow/how-racial-prejudice-can-easily-appear-in-classrooms/10928726>

*The Brown Daily Herald*: <http://www.browndailyherald.com/2014/02/24/researchers-urge-increased-environmental-science-education/>

### **Research Website for Humane Genetics Education**

<https://bscs.org/our-work/rd-programs/towards-a-more-humane-genetics-education/>